AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior listing of claims in this application.

1. (previously amended) A method of forming a chalcogenide comprising device, comprising:

forming a first conductive electrode material on a substrate;

forming chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where "A" at least one element which is selected from Group 13, Group 14, Group 15, or Group 17 of the periodic table;

forming a silver comprising layer over the chalcogenide material;

irradiating the silver effective to break a chalcogenide bond of the chalcogenide material at an interface of the silver comprising layer and chalcogenide material and diffuse at least some of the silver into the chalcogenide material, and forming an outer surface of the chalcogenide material;

after the irradiating, exposing the chalcogenide material outer surface to an iodine comprising fluid effective to reduce roughness of the chalcogenide material outer surface from what it was prior to the exposing; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material, and which is continuous and completely covering at least over the chalcogenide material, and forming the second conductive electrode material into an electrode of the device.

2. (original) The method of claim 1 wherein the iodine comprising fluid is a liquid.

3. (original) The method of claim 1 wherein the iodine comprising fluid is an iodide solution.

4. (original) The method of claim 1 wherein the iodine comprising fluid is a potassium iodide solution.

5. (original) The method of claim 4 wherein the potassium iodide solution comprises from 5 to 30 grams I2 per 1 liter of a from 20% to 50% potassium iodide solution.

6. (original) The method of claim 1 wherein the silver comprising layer is predominately elemental silver.

7. (original) The method of claim 1 wherein the irradiating is effective to form Ag2se as at least part of the outer surface, the etching being effective to etch away at least some of the Ag2Se and thereby at least partially contributing to said roughness reducing.

8. (original) The method of claim 1 wherein "A" comprises Ge.

9. (previously amended) The method of claim 1 comprising forming the device into a programmable memory cell of memory circuitry.

10. (original) The method of claim 1 wherein the first and second conductive electrode materials are different.

11. (previously amended) A method of forming a chalcogenide comprising device, comprising:

forming a first conductive electrode material on a substrate;

forming a chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where “A” comprises at least one element which is selected from Group 13, Group 14, Group 15, or Group 17 of the periodic table;

after forming the chalcogenide comprising material, forming Ag2Se over the chalcogenide comprising material;

after the irradiating, exposing the Ag2Se to an iodine comprising fluid effective to etch away at least some of the Ag2Se; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material and forming t he second conductive electrode material into an electrode of the device.

12. (original) A method of forming a non-volatile resistance variable device, comprising:

forming a first conductive electrode material on a substrate;

forming a chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where "A" is selected from the group consisting of elements and radicals and mixtures thereof which are more electropositive than Se;

after forming the chalcogenide comprising material, forming Ag2Se over the chalcogenide comprising material;

after the irradiating, exposing the Ag2Se to an iodine comprising fluid effective to etch away at least some of the Ag2Se; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material and forming the second conductive electrode material into an electrode of the device.

13. (previously amended) The method of claim 11 comprising forming the device into a programmable memory cell of memory circuitry.

14. (original) The method of claim 12 wherein "A" comprises Ge.

15. (original) The method of claim 12 comprising forming the non-volatile resistance variable device into a programmable memory cell of memory circuitry.

16. (original) The method of claim 12 wherein the iodine comprising fluid is a liquid.

17. (original) The method of claim 12 wherein the iodine comprising fluid is an iodide solution.

18. (original) The method of claim 12 wherein the iodine comprising fluid is a potassium iodide solution.

19. (original) The method of claim 18 wherein the potassium iodide solution comprises from 5 to 30 grams 12 per 1 liter of a from 20% to 50% potassium iodide solution.

20. (previously amended) A method of forming a chalcogenide comprising device, comprising:

forming a first conductive electrode material on a substrate;

forming a chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where "A" comprises at least one element which is selected from Group 13, Group 14, Group 15, or Group 17 of the periodic table;

after forming the chalcogenide comprising material, forming a discontinuous layer of Ag2Se over the chalcogenide comprising material;

after the irradiating, exposing the Ag2Se to an iodine comprising fluid effective to etch away at least some of the Ag2Se; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material, and which is continuous and completely covering at least over the chalcogenide material, and forming the second conductive electrode material into an electrode of the device.

21. (original) The method of claim 12 wherein the exposing is effective to etch away substantially all of the Ag2Se.

22. (original) A method of forming a non-volatile resistance variable device, comprising:

forming a first conductive electrode material on a substrate;

forming a chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where "A" is selected from the group consisting of elements and radicals and mixtures thereof which are more electropositive than Se;

after forming the chalcogenide comprising material, forming a discontinuous layer of Ag2Se over the chalcogenide comprising material;

after the irradiating, exposing the Ag2Se to an iodine comprising fluid effective to etch away at least some of the Ag2Se; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material, and which is continuous and completely covering at least over the chalcogenide material, and forming the second conductive electrode material into an electrode of the device.

23. (original) The method of claim 22 wherein the iodine comprising fluid is a liquid.

24. (original) The method of claim 22 wherein the iodine comprising fluid is an iodide solution.

25. (original) The method of claim 22 wherein the iodine comprising fluid is a potassium iodide solution.

26. (original) The method of claim 25 wherein the potassium iodide solution comprises from 5 to 30 grams 12 per 1 liter of a from 20% to 50% potassium iodide solution.

27. (original) The method of claim 22 doping the chalcogenide comprising material to at least 30 atomic percent Ag in a lowest of a plurality of variable resistance states.

28. (original) The method of claim 22 wherein the exposing is effective to etch away substantially all of the Ag2Se.

29. (original) A method of forming a programmable memory cell of memory circuitry, comprising:

forming a first conductive electrode material on a substrate;

forming a substantially amorphous chalcogenide comprising material over the first conductive electrode material, the chalcogenide material comprising AxSey, where "A" is selected from the group consisting of elements and radicals and mixtures thereof which are more electropositive than Se;

forming a silver comprising layer over the chalcogenide comprising material;

irradiating the silver effective to break a chalcogenide bond of the chalcogenide material at an interface of the silver comprising layer and chalcogenide material and diffuse at least some of the silver into the chalcogenide material, the irradiating being effective to form a discontinuous layer of Ag2Se over the chalcogenide comprising material, the irradiating being effective to maintain the chalcogenide material underlying the Ag2Se in a substantially amorphous state, the irradiating being effective to dope the chalcogenide comprising material to average at least 30 atomic percent silver in a lowest of a plurality of variable resistance states;

after the irradiating, exposing the Ag2Se to an iodine comprising fluid effective to etch away at least a majority of the Ag2Se; and

after the exposing, depositing a second conductive electrode material over the chalcogenide material, and which is continuous and completely covering at least over the chalcogenide material, and forming the second conductive electrode material into an electrode of the device.

30. (original) The method of claim 29 wherein the iodine comprising fluid is a liquid.

31. (original) The method of claim 29 wherein the iodine comprising fluid is an iodide solution.

32. (original) The method of claim 29 wherein the iodine comprising fluid is a potassium iodide solution.

33. (original) The method of claim 32 wherein the potassium iodide solution comprises from 5 to 30 grams ^ per 1 liter of a from 20% to 50% potassium iodide solution.

34. (currently amended) A method of forming a chalcogenide structure, comprising:

forming a chalcogenide glass layer;

forming a metal-containing layer over the chalcogenide glass layer;

irradiating said metal-containing layer to break a chalcogenide bond of the chalcogenide glass layer at the interface of the metal-containing layer and chalcogenide glass layer, such that at least a portion of the metal-containing layer diffuses into the chalcogenide glass layer; and,

after said step of irradiating, exposing an outer surface of the chalcogenide glass layer to an iodine comprising fluid, wherein said iodine comprising fluid removes at least a portion of said <u>irradiated</u> outer surface.

35. (previously presented) The method of claim 34, wherein the iodine comprising fluid is a liquid.

36. (previously presented) The method of claim 34, wherein the iodine comprising fluid is an iodide comprising solution.

37. (previously presented) The method of claim 34, wherein the iodine comprising fluid is a potassium iodide solution.

38. (amended) The method of claim 37, wherein the potassium iodide solution comprises from 5 to about 30 grams I_2 per liter of a from 20% to about a 50% potassium iodide solution.

39. (amended) The method of claim 34, wherein the irradiating is effective to form Ag_2Se as at least part of the outer surface, the etching being effective to etch away at least some of the Ag_2Se.

40. (previously presented) The method of claim 34, wherein the metal-containing layer is a silver comprising layer.

41. (previously presented) The method of claim 40, wherein the silver comprising layer is predominately elemental silver.

42. (previously presented) A method of forming a chalcogenide structure, comprising:

forming a first conductive layer on a semiconductor substrate;

forming a chalcogenide glass layer over said first conductive layer;

forming a metal-containing layer over said chalcogenide glass layer;

irradiating said metal-containing layer to break a chalcogenide bond of the chalcogenide glass layer at the interface of the metal-containing layer and chalcogenide glass layer thereby creating an outside surface;

removing at least a portion of said outside surface by etching with an iodine comprising fluid; and,

after said step of removing at least a portion of said outside surface, forming a second conductive layer over at least a portion of the outside surface remaining after said act of removing.

43. (previously presented) The method of claim 42, wherein the iodine comprising fluid is a liquid.

44. (previously presented) The method of claim 42, wherein the iodine comprising fluid is an iodide comprising solution.

45. (previously presented) The method of claim 42, wherein the iodine comprising fluid is a potassium iodide solution.

46. (previously presented) The method of claim 45, wherein the potassium iodide solution comprises from 5 to about 30 grams I_2 per liter of a from 20% to about a 50% potassium iodide solution.

47. (previously presented) The method of claim 42, wherein the irradiating is effective to form Ag_2Se as at least part of the outside surface, the etching being effective to etch away at least some of the Ag_2Se.

48. (previously presented) The method of claim 42, wherein the metal-containing layer is a silver comprising layer

49. (previously presented) The method of claim 48, wherein the silver comprising layer is predominately elemental silver.

50. (previously presented) The method of claim 42, wherein said first conductive layer and second conductive layer are electrodes.

51. (previously presented) A method of forming a chalcogenide structure, comprising:

forming a first conductive layer on a semiconductor substrate;

forming a chalcogenide glass layer over said first conductive layer;

forming a metal-containing layer over said chalcogenide glass layer;

irradiating said metal-containing layer to break a chalcogenide bond of the chalcogenide glass layer at the interface of the metal-containing layer and chalcogenide glass layer thereby creating an outside surface, said step of irradiating is effective to form

Ag_2Se as at least part of the outside surface;

removing at least a portion of said outside surface by etching with an iodine comprising fluid, said etching being effective to etch away at least some of the Ag_2Se; and,

after said step of removing at least a portion of said outside surface, forming a second conductive layer over at least a portion of the outside surface remaining after said act of removing.